(12) UK Patent Application (19) GB (11) 2 040 327 A

(21) Application No 8002579
(22) Date of filing 25 Jan 1980
(30) Priority data
(31) 2902905
(32) 26 Jan 1979
(33) Fed. Rep of Germany (DE)
(43) Application published
28 Aug 1980
(51) INT CL³
D03D 15/00
(52) Domestic classification
D1K 210 22X 23X 38X 430
454 470 480 571 57Y 584
688 68Y
(56) Documents cited
GB 1430404
GB 1413200
GB 1039488
(58) Field of search
D1K
(71) Applicants
Akzo N.V.
Arnhem/Nederland,
Ijssellaan 82,
The Netherlands.
(72) Inventors
Reinhard Droste,
Wolfgang Thorand.
(74) Agents
Elkington and Fife

(54) **Production of brightly colour-patterned safety belts**

(57) A process for the production of a brightly colour-patterned safety belt comprises weaving the belts using at least two spun-dyed synthetic yarns of different colours, at least one yarn having a bright colour.

GB 2 040 327 A

2040327

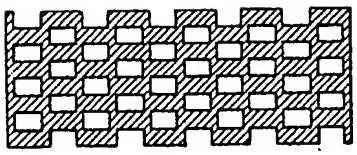

Fig . 1

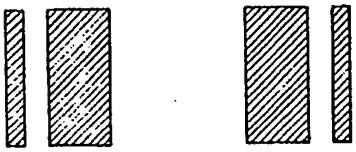

Fig . 2

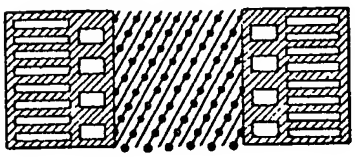

Fig . 3

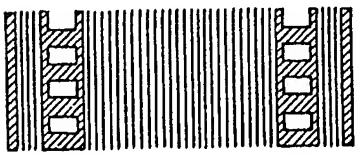

Fig . 4

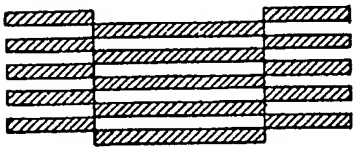

Fig . 5

SPECIFICATION

Production of brightly colour-patterned safety belts

This invention relates to the production of brightly colour-patterned safety belts; more particularly, it relates to a process for the production of brightly colour-patterned safety belts for, for example, automobilies and aircraft.

Safety belts are generally made in one colour, usually the neutral colours black or grey. Spun-dyed synthetic yarns are available to the belt manufacturer in these neutral colours, i.e. synthetic, generally melt-spun yarns containing coloured pigments which have been added to and mixed with them either in the melt or during the polycondensation or polymerisation reaction. In addition, raw white yarns are available for belt manufacture.

It is known that black-dyed yarns may be woven together with raw white yarns to form safety belts. Interesting patterns may be obtained by using different weaves and/or colour sequences. The raw white may be left intact, in which case a pattern in the neutral colours black and white is formed, or alternatively the raw white yarn may be coloured during piece-dyeing of the belt, in which case a pattern is formed in the neutral colour black and a bright colour, for example red.

It is also known that two raw white yarns having a different affinity for dyes may be used for belt manufacture, one or both yarns being subsequently dyed. In this case, patterns are formed in the neutral colour white and a bright colour, for example red, or in two bright colours, for example red and blue. From the point of view of dyeing, however this process is only workable (a) where two differently-dyeable yarns of the same material are used (hitherto unknown in the case of high-strength commercial yarns), or (b) where two yarns of different materials, for example polyamide and polyester, are used. However, this involves the following technical problems: as raw white yarns, the different materials inherit from the production thereof different yarn characteristics which cannot be brought into line with one another during the dyeing process. In addition, the difference in the materials means different dyeing conditions. Both factors lead to different shrinkage and elongation behaviour. In addition, it is inevitable that the dye for one yarn component is also readily taken up to a different extent by the other yarn component. Accordingly, it is very difficult or even impossible to obtain a required colour. Another disadvantage lies in the fact that, during the thermofixing of the belt in order to establish a certain elongation characteristic of the belt, such differences in the shrinkage and elongation behaviour of the yarns may lead to differences in the load applied to the warp filaments in the belt, resulting in an undesirable reduction in the strength of the belt. In addition, yarns having different shrinkage and elongation behaviour lead to waviness of the belt and hence to poor wear behaviour.

In the production of brightly colour-patterned safety belts by the processes described above, there is also the problem of the reproducibility of dyeing which is encountered with a number of dyes.

If nowadays it is desired to adapt the colour and/or pattern of a car safety belt, for example, to the paintwork or upholstery of the car, the following processes only are available apart from the possibilities mentioned above with the limitations thereof in terms of colour. Firstly, a safety belt may be woven in raw white and subsequently colour-printed. This process is very expensive, but, above all, does not guarantee the colour fastness required when the belt is being worn (i.e. fastness to light, rubbing and perspiration). Secondly, it is possible to resort to yarns which after production have been dyed in a variety of colours, so-called "yarn-dyed" yarns, and to produce colour-patterned belts by using various bright colours, optionally in conjunction with spun-dyed black or white yarns, again using various weaves and colour sequences. Yarn-dyed utility yarns of this type are first and foremost relatively expensive to produce. In addition, the weaver or dyer has to have a number of dyes and colours at hand (problem of storage). Furthermore, another disadvantage of the last-mentioned method is the occasionally unsatisfactory colour fastness of the yarn-dyed yarns.

An object of the present invention is to enable safety belts to be individually patterned in various bright colours, the neutral colours black, grey and white optionally being used to tone down the bright colours (lightening or darkening) in the context of known weaves and/or colour sequences. In addition, the reproducibility of the various hues and the colour fastness thereof is intended to be guaranteed and economic stockkeeping made possible.

In achieving this object, the present invention starts out from the new concept of producing safety belts brightly patterned through known weaves and/or colour sequences using a small number of spun-dyed brightly coloured yarns, optionally in conjunction with spun-dyed neutral-coloured yarns, the hues involved being reproducible and colour-fast.

Accordingly, the present invention achieves the above object in that the belts are woven using at least two spun-dyed synthetic yarns of different colour, at least one yarn hving a bright colour, and using known weaves.

In contrast to the neutral colours which have neither hue nor saturation, merely different degrees of lightness, "bright colours" are to be understood to be colours having a certain hue, a certain lightness and a certain saturation, cf, for example, "Handworterbuch der Naturwissenschaften", 2nd Edition, Vol. 3, Gustav Fischer-Verlag Jena, 1933, pages 979 *et seq* (Farbenlehre) and 'BROCKHAUS ABC der Optik", VEB F,.A. Brockhaus Verlag, Leipzig 1961, page 244 (Farbe).

"Weaves" are to be understood to be the various ways of crossing warp and weft threads in the weaving

field, for example the systematically built-up foundation weaves linen weave, twill weave and satin weave and the derivative weaves capable of being developed therefrom. It is preferred to use twill weaves, particularly the $\frac{2}{2}$ twill.

The advantages of using solely spun-dyed yarns are as follows: optimal uniformity of colour within the individual colours and hence also within the belt pattern; *optimal colour fastness; optimal wear resistance; optimal heat and light stability; substantially knotless warp yarns; absolute reproducibility of certain colour combinations in contrast to yarn-dyed types; stockkeeping visible at a glance (optimisation of costs); production of a variety of hues by "mixing", combining various primary colours through weave and/or colour sequence.

"Colour sequence" is to be understood to be the arrangement of the various colours relative to one another in the warp. If, for example, the colours red (R) and gold (G) are used, different patterns are formed for the same weave when the colour sequence in the warp is R - G - R - G - and so on, R - G - G - R - G - G- and so on or R - R - G - G - R - R - and so on.

In addition to the patterns obtainable through different weaves and/or different colour sequences, adjacent strips of different colour or different weave may also be woven over the width of the belt, for example block strips (e.g. edges in red, centre in gold).

Preferably, differently patterned strips are woven over the width of the belt by changing the weave and/or by changing the colour sequence. Where twill weaves are used, the weave may be changed simply by changing the twill line.

On account of the high tensile strength required for safety belts, high strength polyester yarns are also preferably used for the synthetic yarns spun-dyed in bright colours. These yarns are, in particular, polyethylene terephthalate yarns having an ultimate tensile strength of from 50 to 90 cN/tex, preferably from 60 to 80 cN/tex. On account of the necessary heat-fixing of the belts, the various spun-dyed yarns should have a uniform shrinkage level in hot air (after 15 minutes at 190°C) of from 8 to 22%, preferably from 10 to 20%. The yarns should have a uniform breaking elongation of from 10 to 15%, more particularly from 12 to 14%. Furthermore, the spun-dyed yarns should have an overall denier from 100 to 3000 dtex, preferably from 550 to 1670 dtex, for an individual denier of from 5 to 20 dtex, preferably from 8 to 15 dtex.

In order to be able fully to utilise the advantages afforded by the present invention, particularly the advantage of the wide variety of patterns for minimal stockkeeping, it is advantageous to use in one factory less than eight brighspinning dyes in the so-called "primary colours" which, in combination with one another or with the neutral colours black, gray and/or white, provided for a generally adequate range in regard to patterning and/or colour toning.

It is preferred to use only the colours red, green, blue and beige or gold as the bright colours for the spun-dyed yarns. In some cases, it may be useful to add brown.

The present invention is illustrated in the accompanying drawings wherein Figures 1 to 5 illustrate (not in colour, but, through printing, in the neutral colours black and white) a small selection from the large number of possibilities of producing safety belts brightly coloured-patterned through different weaves, changes in weave and colour sequence using only two colours. The range of possible patterns is, of course, greatly increased by using more than two colours.

Figure 1 shows a fancy pattern with the weave twill $\frac{2}{2}$ with Z- and S-line in alternation:

Twill Line (offset)	Z				S				Z		
Colour sequence e.g. black	8	2		2	8	2	2	8			
(No. of filaments) red			2	2		2	2				
	x4					x4					
					x 5						

Figure 2 shows part of a belt in which two colours, for example red and blue, are separated from one another in clear block strips. The weave is twill $\frac{2}{2}$ throughout, again with Z- and S-line in alternation:

Twill Line (offset)	Z	S	Z	S	Z
Colour sequence e.g. red	16	80	80		16
(No. of filaments) blue	24		168		24

The number and width of the strips may be varied. Also, the colours may be combined within the strips, resulting in the formation of mixed colours (hues).

The structure of the belt illustrated in *Figure 3*, which was again woven in twill $\frac{2}{2}$ with Z- and S-line in alternation is as follows:

Twill Line	S			Z			S		
e.g. black	8	1	8	2	8	8	2	8	1	8
red		1				3			1	
beige						3				
green				2			2			
Colour sequence		x36		x8		x25	x8		x36	

The belt illustrated in Figure 4 is similar in structure to the belt shown in Figure 3 (twill $\frac{2}{2}$):

Twill Line	S			Z			S		
e.g. red	8		8	2	8	8	2	8		8
black		4							4	
beige		4				4			4	
blue				2			2			
white						4				
Colour sequence		x5		x6		x29	x6		x5	

The belt shown in Figure 5 may have the following alternative structure based, for example, on the following patterns (twill $\frac{2}{2}$):

(a) Twill line alternating, offset, colour sequence constant:

Twill Line (offset)	Z	S	Z
Colour sequence e.g. black	1	1	1
(No. of filaments) red	1	1	1
	x52	x100	x52

(b) Twill Line constant; colour sequence alternating:

Twill Line (throughout)		Z	
Colour sequence e.g. black	1	1	1
(No. of filaments) red	1	1	1
	x52	x100	x52

Using the process according to the present invention, it is possible, for example, to produce up to 12 adjacent strips with different, in some cases repeating patterns or primary colours for conventional belt widths of approximately 50 mm. By differently distributing the colours (in the case of two colours, for example 10:90 to 90:10), it is possible to "mix" a variety of different hues, the neutral colours white and black optionally being used for lightening or darkening. The colour sequence may also be varied as required, for example, from 1/1 to 10/10 (for example red - green red - green ..... or R - R - G - G ..... or R - G - G - R - G - G- ..... and so on). In junction with the weave (for example twill $\frac{2}{2}$, colour sequence black - black - red at the edges, colour sequence black - red - red in the middle), it is possible to obtain interesting patterns, for which purpose the twill line may in addition be changed from strip to strip.

CLAIMS

1. A process for the production of a brightly colour-patterned safety belt which comprises weaving the belts using at least two spun-dyed synthetic yarns of different colour, at least one yarn having a bright colour.
2. A process as claimed in claim 1, in which strips variously patterned by changing the weave and/or the colour sequence are woven over the width of the belt.
3. A process as claimed in claim 1 or claim 2, in which the spun-dyed synthetic yarns are high-strength polyester yarns.
4. A process as claimed in claim 3, in which the polyester yarns comprise polyethylene terephthalate and have an ultimate tensile strength of from 50 to 90 cN/tex.
5. A process as claimed in claim 4, in which the ultimate tensile strength is from 60 to 80 cN/tex.
6. A process as claimed in any of claims 3 to 5 in which the polyester yarns have a shrinkage in hot air (15 minutes, 190°C) of from 8 to 22%.
7. A process as claimed in claim 6 in which the shrinkage is from 10 to 20%.
8. A process as claimed in any of claims 3 to 7 in which the polyester yarns have a breaking elongation of from 10 to 15%.

9. A process as claimed in claim 8 in which the breaking elongation is from 12 to 14%.

10. A process as claimed in any of claims 1 to 9 in which the synthetic yarns have a total denier of from 100 to 3000 dtex for an individual denier of from 5 to 20 dtex.

11. A process as claimed in claim 10 in which the total denier is from 550 to 1670 dtex for an individual denier of from 8 to 15 dtex.

12. A process as claimed in any of claims 1 to 11 in which less than eight coloured spinning dyes are used.

13. A process as claimed in claim 12 in which the coloured spinning dyes used are coloured red, green, blue, beige or gold, and optionally brown.

14. A process as claimed in claim 1 substantially as herein described.

15. A safety belt when produced by a process as claimed in any of claims 1 to 14.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon Surrey, 1980.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.